

Feature Story: Viral Hemorrhagic Septicemia: A New Invader in the Great Lakes

Viral Hemorrhagic Septicemia (VHS) virus is one of the most feared fish diseases world-wide, and it has made its way into the Great Lakes. Biologists are concerned that the VHS virus could spread via the Chicago waterway and other Great Lakes tributaries into the Mississippi and Ohio River basins.

As spring approaches, the La Crosse Fish Health Center (FHC) will be working with state, federal and tribal partners in the Great Lakes in a basin-wide effort to monitor the spread of the VHS virus. La Crosse staff will also conduct surveillance outside the basin and provide technical assistance to tribal partners in the Great Lakes with the inspection of their hatcheries' VHS-susceptible species such as walleye and muskellunge.

First reported as a disease of European rainbow trout in 1938, VHS was not identified as the responsible disease pathogen until 1963. Since then, three VHS genotypes have been isolated from fish in Europe, and in 1988, a scientist isolated a fourth genotype from marine fish in the Pacific Northwest. One of the European genotypes significantly affects freshwater salmonids and pike; the remaining two affect marine fish.

Suspected vectors for VHS's introduction and spread in the Great Lakes include ballast water, movement of baitfish and natural migration of fish. For this reason, most of the states and provinces in the Great Lakes basin are considering or have taken steps to limit the uptake and discharge of ballast water or limit the movement of wild baitfish harvest from their waters.

In the spring of 2005, a significant die-off of freshwater drum occurred in the Bay of Quinte in Lake Ontario. The Ontario Ministry of Natural Resources isolated VHS from the fish. Although this was the first report of VHS in the Great Lakes, it was not the first isolation of the virus from the Great Lakes.

Biologists at Michigan State University had isolated an unknown virus from a muskellunge caught in Lake St. Clair in 2003, but did not pursue identification of the virus until learning of the Lake Ontario isolation. The Lake St. Clair isolation was confirmed as VHS in December 2005. These two separate reports of VHS placed the virus into emerging pathogen status in the Great Lakes basin.

In 2006, scientists isolated VHS during fish kills in lakes Erie, Ontario and St. Clair, the St. Lawrence River, and Conesus Lake, the westernmost Finger Lake in New York which is connected to Lake Ontario via the Genesee River. Fish affected included yellow perch, muskellunge, smallmouth bass and walleye.

In April, 2006, a significant mortality of freshwater drum was observed in the western basin of Lake Erie. The La Crosse FHC assisted the Ohio Division of Wildlife (ODW) with collection of bacterial and viral samples from 12 drum from Lake Erie near Sandusky, Ohio. The samples were processed at the La Crosse FHC lab and VHS was isolated.

The samples were forwarded to the U.S. Geological Survey Western Fisheries Research Center in Seattle, where the virus was confirmed to be VHS. DNA sequencing results were identical to the Lake Ontario freshwater drum and Lake St. Clair muskellunge isolates.

The ODW received a report of significant mortality of yellow perch from the central basin of Lake Erie in late May 2006. Once again, testing revealed that VHS was the cause. To date, all of the VHS isolates from throughout the Great Lakes have been genetically identical, indicating that this is a new introduction that has probably had assistance—such as ballast water—in spreading in the Great Lakes.

Other Great Lakes fish species that have been shown to be VHS carriers include bluegill, crappie, emerald shiner, northern pike, redhorse sucker, smelt, and white bass, though no fish kills of these species have been blamed on VHS to date. Disease signs reported with the Great Lakes genotype include hemorrhages in skin and muscle tissue, exophthalmia ("pop-eye"), abdominal fluid, distended abdomen, abnormal organs and necrosis of organ tissues.

Significant fish kills are expected to occur as VHS spreads into these new areas, and native fish populations or year classes in areas where the virus has already occurred will be susceptible to periodic outbreaks of VHS in the future.

In January, the Michigan Department of Natural Resources (DNR) reported that VHS had been isolated from Chinook salmon, lake whitefish and walleye from the Thunder Bay and Rogers City, Mich., areas of Lake Huron. Although mortality was not associated with this report, the fish showed clinical signs of VHS.

This spring, VHS was confirmed in a brown trout that washed onto shore near Algoma, Wisconsin. This fish showed clinical signs of VHS and was the first confirmed report of VHS in Lake Michigan. Smallmouth bass collected from Sturgeon Bay (Lake Michigan) as part of VHS surveillance efforts of the Wisconsin DNR and the La Crosse FHC were also VHSV-positive, although they did not show clinical signs.

Viral hemorrhagic septicemia has been confirmed to be the cause of a fish kill this spring in Budd lake (black crappie, bluegill, muskellunge), an inland lake located in central Michigan. In Wisconsin VHS has been confirmed to the cause of freshwater drum mortality in Little Lake Butte des Morts and Lake Winnebago, both part of the Lake Winnebago system which has a significant lake sturgeon population. The Lake Winnebago system is connected to Lake Michigan via the Fox River.

In response to the significant scale of the VHS outbreaks in the Great Lakes, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) issued a Federal Order on Oct. 24, 2006, prohibiting the interstate movement of VHS-susceptible species from Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin, as well as the importation of these species from Canadian provinces of Ontario and Quebec.

APHIS later amended the Federal Order to allow interstate movement from the affected states if the fish tested negative for VHS according to one of several standards, including the Fish and Wildlife Service's Standard Procedures for Aquatic Animal Health Inspections. Interstate movement was also allowed for human consumption if fish were transferred to a state-inspected slaughter facility. APHIS plans to issue an Interim Rule on VHS this spring. Following a comment period, the interim rule would become permanent.

The scale of the VHS outbreak in 2006 and the subsequent Federal Order have already had a significant impact on the operations of federal, state and tribal natural resource agencies, as well the private sector. The most significant impact has been—and will continue to be—on the movement of warm and cool water fish, a major component of state and tribal hatchery programs.

Historically, fish health inspections have not been performed on warm and cool water fish species. Often these species are not at the culturing facility long enough for inspection laboratory tests to be completed prior to stocking. In these instances, brood stock (which is often from wild stocks) will need to be tested prior to egg take to ensure that the virus is not passed down from parents to progeny. The APHIS rules should not have a significant impact on salmonid fish operations since cold water species have historically received fish health inspections.

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